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I, KAY WARD, TEAM LEADER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. PQ 2808 for a patent by PETER RAFFAELE and MICHAEL RAFFAELE filed on 14 September 1999.

WITNESS my hand this
Eleventh day of April 2000

KAY WARD
TEAM LEADER EXAMINATION
SUPPORT AND SALES

AUSTRALIA
Patents Act 1990
PROVISIONAL SPECIFICATION
FOR A PROVISIONAL PATENT

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Invention Title: **Fluid Machines**

The following statement is a description of this invention

Fluid Machines

This invention relates to scotch yoke type piston fluid devices and provides novel arrangements of the crank, pistons and interconnecting mechanisms.

In conventional scotch yoke type piston fluid machines a slider is rotatably mounted on the big end of a crank, which orbits about a main axis. The slider is constrained to move along a linear slot in the piston assembly which is generally perpendicular to the cylinder axis. Thus, as the crank rotates, the piston is caused to reciprocate along the cylinder.

In single piston devices, the linear slot is positioned on the cylinder axis and so that at top dead centre the big end lies between the piston and the main axis.

We have created various novel and inventive configurations which depart from this standard.

In one broad form, the invention provides a reciprocating piston fluid device including

a crank mechanism including a big end which orbits about a main axis, the big end having a big end axis;

connecting means rotatable mounted on the big end for rotation about the big end axis;

a single piston mounted for reciprocal motion in a cylinder and including engagement means for engaging the connecting means, whereby the piston reciprocates in the cylinder as the big end orbits the main axis;

wherein, at top dead centre, the main axis lies between the piston and the big end axis.

This, in effect, is the reverse of the norm.

In another form, the invention provides a reciprocating piston fluid device including:

a crank mechanism including a big end which orbits about a main axis, the big end having a big end axis;

at least one connecting means rotatable mounted on the big end for rotation about the big end axis;

at least one piston mounted in a respective cylinder for reciprocal motion along a cylinder axis;

engagement means interconnecting the at least one piston and the at least one connecting means,

wherein the main axis is not located on the or any of the at least one cylinder axes.

Preferably, when the or one of the pistons is at top or bottom dead centre a line joining the main and big end axes is parallel to and spaced from the respective cylinder axis of the one piston.

Preferably, the or each engagement means includes guide means to constrain the respective piston or pistons to move along the respective cylinder axis.

The invention shall be better understood from the following, non limiting, descriptions of embodiments and the drawings, in which

Figure 1 is an axial end view of a first embodiment of the invention;

Figure 2 is an axial end view of a second embodiment of the invention;

Figure 3 is an axial end view of a third embodiment of the invention;

Figure 4 is an axial end view of a fourth embodiment of the invention;

Figure 5 is an axial end view of a fifth embodiment of the invention.

Referring to Figure 1, there is shown a fluid device 10 having a crank 12 which rotates about a crank axis 14 and has a big end 16 with a big end axis 18. Mounted on the big end 16 is a connecting means 20, which may rotate on the big end about big end axis 18. The connecting means includes a linear slot 22 in which an engagement means 24 is received. The engagement means may move along the slot 22, by sliding, via roller type bearings or via other means.

Mounted on the engagement means 24, or integral therewith, is a piston 26, which is mounted in a cylinder 28 for reciprocal motion along cylinder axis 30.

The engagement means 24 is in the form of a triangular loop and the connecting means is positioned so that the linear slot 22 always lies with the big end axis between the slot 22 and the piston 26. The piston 26 is constrained to move along the cylinder axis 30 and so as the crank rotates, the slot 22 remains horizontal with the connecting means 20 moving both vertically (and moving the piston) and side ways, relative to the engagement means.

The effect of this arrangement is that the crank axis may be moved nearer the cylinder head 32 than otherwise.

Figure 2 shows a variation of the Figure 1 embodiment in which all parts and arrangements are the same except for the engagement means. Accordingly, the same numbers are used for the same components.

In the Figure 2 device, the engagement means 40 is not a closed loop but is open on one side. This may aid in assembly but functionally the arrangement is identical to that of Figure 1.

Figure 3 shows a third embodiment which, in some ways, is derived from the Figure 2 device.

The Figure 3 device 50 includes a crank 52, crank axis 54, big end 56 and big end 58. Connecting means 60 is rotatable mounted on big end 58.

Two co-axial cylinders 62 are provided with respective pistons 64 mounted for motion along the common axis 66. The crank axis 54 is remote from axis 66.

The two pistons are mounted on or integral with a common engagement means 68, which is generally T-shaped with an arm 70 extending away from axis 66. Preferably, the arm 70 extends at 90° to the axis 66 but this is not essential. Also, preferably, the arm extends from approximately mid-way between the pistons 64, but again this is not essential.

The arm engages the connecting means 60, preferably via a sliding tongue and groove or slot arrangement to allow motion of the connecting means along the arm 70. The arm is preferably linear but need not be.

The arm 70 extends past the connecting means 60 and at its free end has a guide member 72 which is mounted on or in guide means 74. The guide means 74 defines a slot 76 which extends parallel to axis 66 and so aids in ensuring that motion of the pistons 64 and engagement means 68 is parallel to axis 66. Guide member or members 78 mounted along the axis 66 also aid in stabilising the motion of the pistons 64.

Figure 4 shows a first embodiment of the invention 80 which is based on the Figure 1 embodiment but includes two co-axially opposed pistons 90.

In this embodiment, there is provided a common engagement means 82 which engages the connecting means. The engagement means is effectively the same as two of the engagement means of the Figure 1 device joined about a common cross-piece 84.

Figure 5 shows a further embodiment 100 having a similar piston, crank and cylinder lay-out to the Figure 4 device. In this embodiment, the engagement means 102 is Z-shaped but otherwise the device is functionally equivalent to that of Figure 4.

It will be apparent to those skilled in the art that many modifications and variations may be made to the embodiments described herein without departing from the spirit or scope of the invention.

Dated this 10th day of September, 1999

Peter Robert Raffaele and Michael John Raffaele

By their Patent Attorneys

Chrysiliou Moore Martin

Fig 1

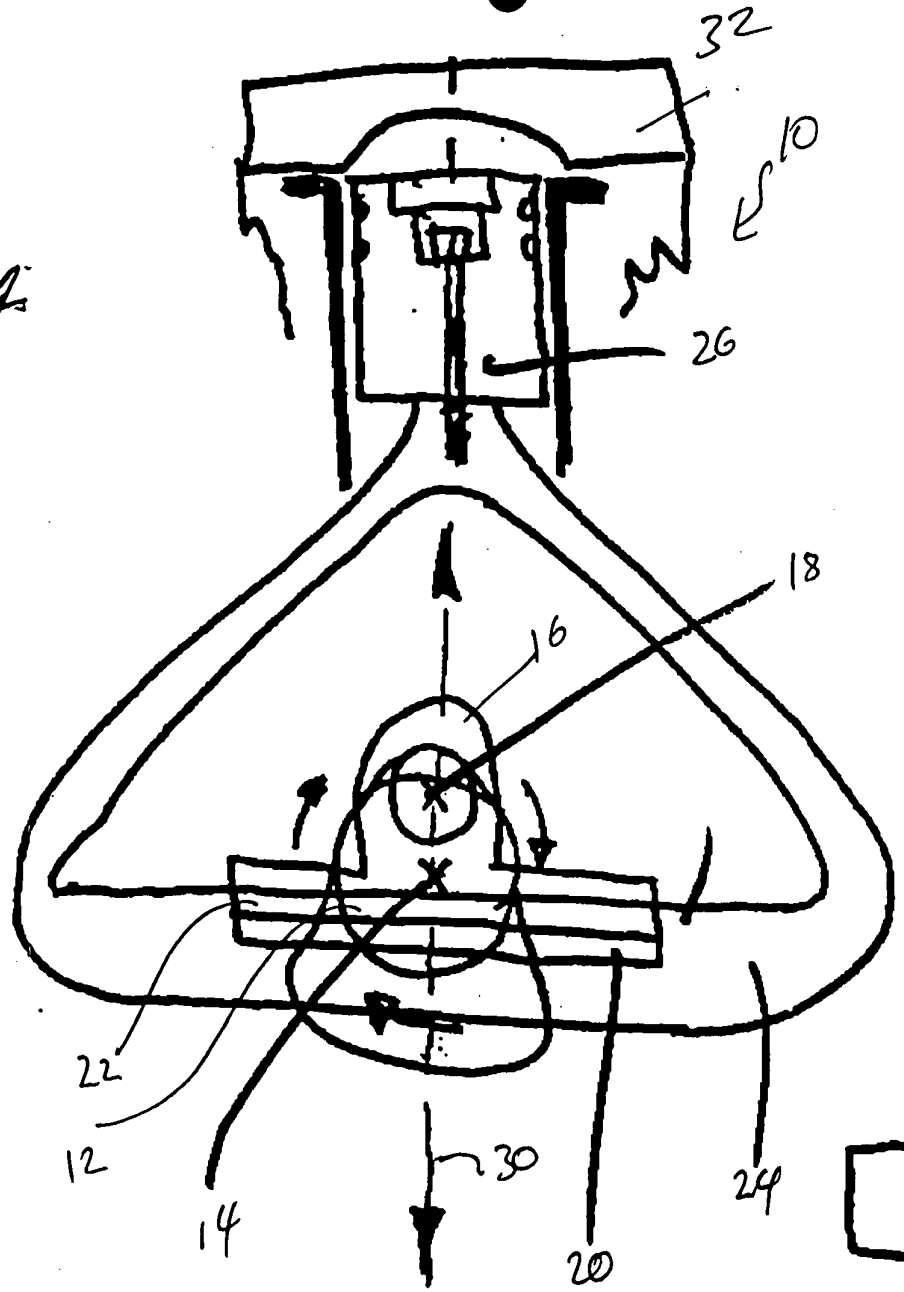
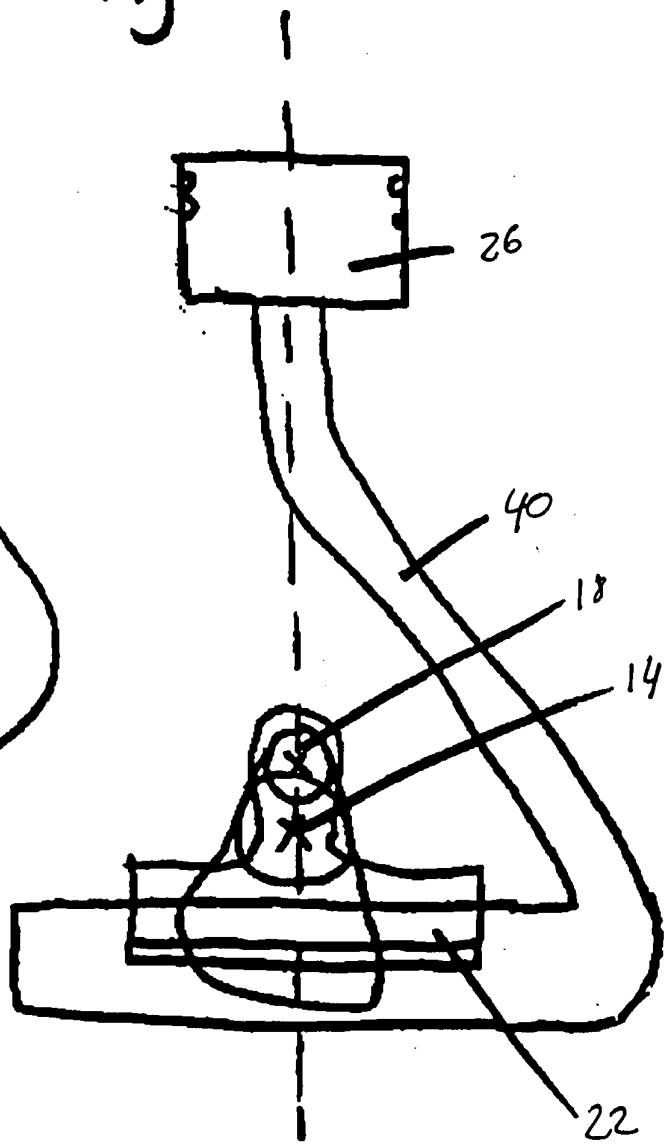


fig 2



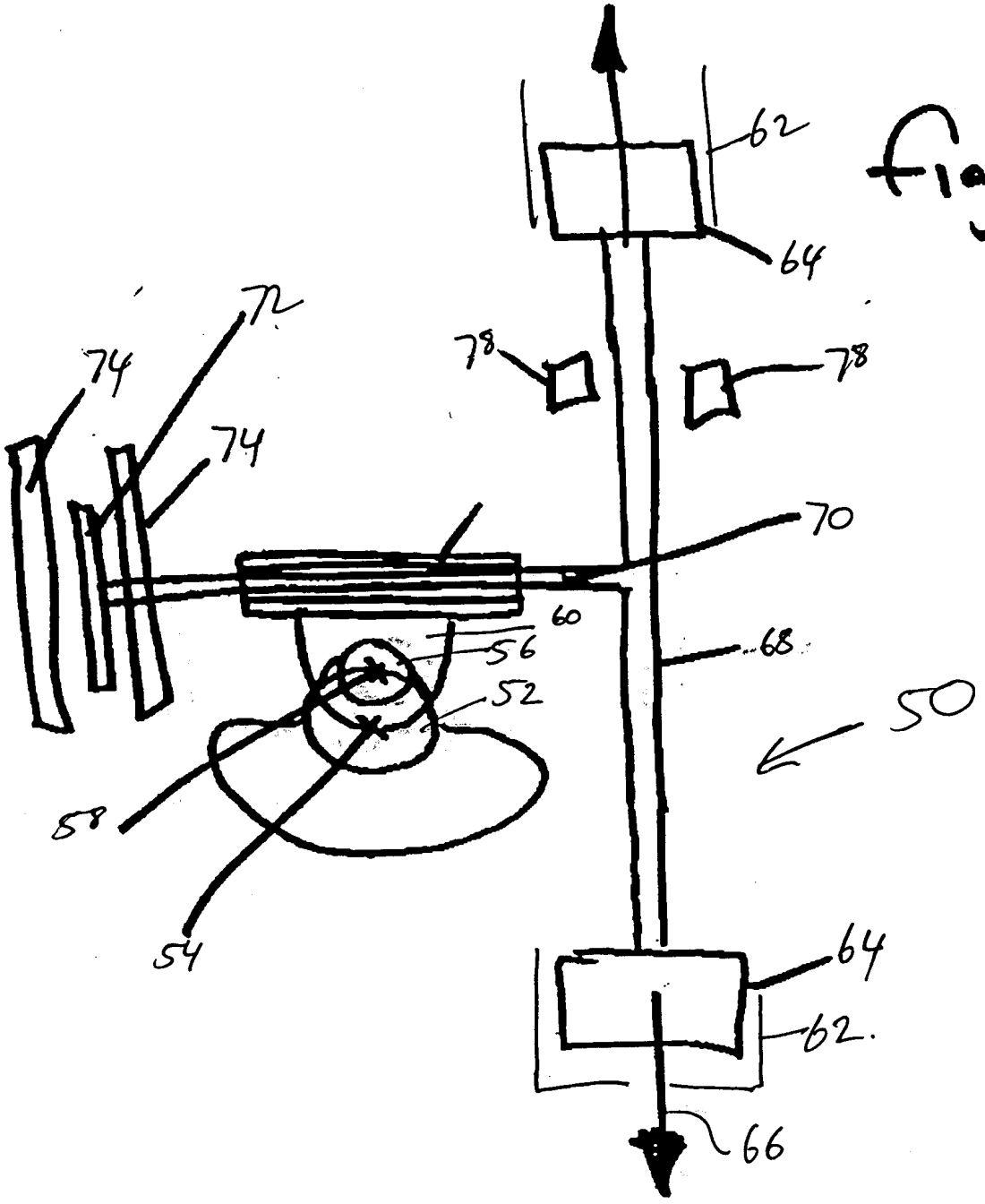


fig 3

Fig 4

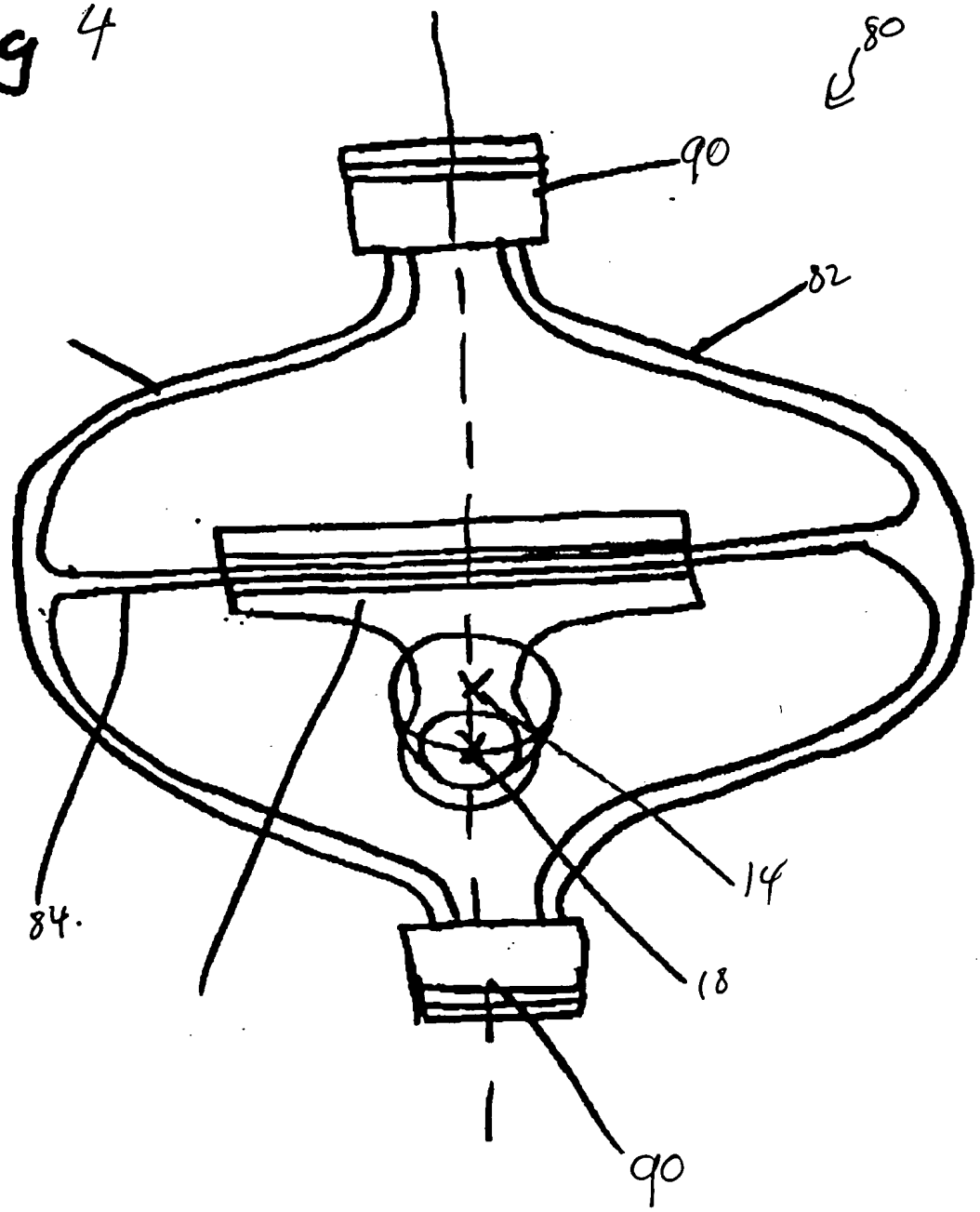


fig 5